DOCTOR OF PHILOSOPHY
IN
METEOROLOGY

THE CALIFORNIA COASTAL JET: SYNOPTIC CONTROLS AND TOPOGRAPHICALLY INDUCED MESOSCALE STRUCTURE

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The low-level jet along the coast of southern Oregon and California is examined in detail through an extensive data set and the application of COAMPS, a mesoscale model, for the purpose of improving forecasts in challenging littoral environments. The jet forms within the broad equatorward flow established by the pressure gradient between cool ocean and warm land. The inception of the jet along the coast is about 250 kilometers south of the axis of a northeastward extension of the eastern North Pacific high, and the jet may extend equatorward and offshore for hundreds of kilometers. Wind magnitudes increase in association with a reorientation of the coastal surface pressure gradient such that an increased down-coast component exists. Within 200 kilometers of the coast, considerable diurnal and spatial variability are observed and predicted by the model. The frequently observed low-level high wind areas at specific locations along the coast are caused by the combined effects of supercritical expansion within the boundary layer and mountain wave-type flow above the marine layer over six coastal mountain areas in close proximity to the coast. While the expansion fan effects are localized near a coastal bend, it is the offshore extension of the mountain wave that accounts for the large spatial extent of the maximum wind areas offshore.

KEYWORDS: Coastal jet, Low-level Winds, Marine Boundary Layer, Mountain Wave, Supercritical Flow, COAMPS, Mesoscale Modeling, Lee-side Wind Maxima, Topographic Effects, Orographic Effects, Expansion Fans, Coastal Meteorology, Littoral Meteorology, Marine Environment